

diabetes metrics between pharmacies located in zip codes with high versus low Hispanic populations. Analyze prevalence, incidence, new patient age, therapy adherence, inferred disease severity, and inferred disease progression. **METHODS:** Catalina Health™ receives a nationally representative sample of pharmacy data containing 40% of all US retail prescription volume and 130 million unique patient ID's. The data is HIPAA compliant, updated daily, longitudinal, and not projected. Select a cohort of patients (40% random sample) filling diabetes scripts in the 1st quarter of 2007 in zip codes with low ( $\leq 3\%$ ) or high ( $25\% +$ ) Hispanic population based on US census data. Overall the high group averages 50% Hispanic. Use a 1 year look-back period, and follow the patient cohort for 4 years. Consider patients adherent when Proportion of Days Covered (PDC)  $\geq 80\%$ . **RESULTS:** Diabetes patients available for analysis varied by metric: prevalence (478k), incidence (58k), adherence (31K). Logistic regression adjusting for covariates, or ANCOVA models are fit depending upon the metric. Covariates include average age of all patients visiting the pharmacy, proportion female, state, retailer chain, median income of the pharmacy's zip code, and rural zip code designation. Patients in high Hispanic populations have 26% greater prevalence of diabetes (OR=1.26, p-value<0.0001), and 25% greater incidence (OR=1.25, p-value<0.0001). Additionally, they are 20% less likely to be adherent to therapy after 24 months (OR=0.80, p-value<0.0005), and 17% less likely after 48 months (OR=0.83, p-value<0.0055). **CONCLUSIONS:** High Hispanic populations have significantly higher incidence and prevalence of diabetes. They are also significantly less adherent to therapy. No differences are seen in age of new diabetes patients, inferred disease severity, or inferred disease progression. Culturally relevant diabetes education should be provided in US geographies with high Hispanic populations.

## PDB84

## LIBERALIZATION OF MEDICAL SAVINGS ACCOUNTS FOR OUTPATIENT TREATMENT AND HEALTH CARE UTILIZATION AMONG TYPE 2 DIABETES MELLITUS PATIENTS

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**OBJECTIVES:** To control the cost of chronic diseases, Singapore allowed individuals to draw on their medical savings accounts to pay for protocol-driven outpatient treatment in October 2006. Previously, only inpatient care was covered. In this study, we evaluated the impact of the Medisave for Chronic Disease Management Program (CDMP) on hospitalization, and healthcare costs for Type 2 Diabetes Mellitus (T2DM) patients. **METHODS:** A retrospective longitudinal T2DM cohort study was conducted using the National Healthcare Group (NHG) diabetes registry (2006-2009). Singapore residents aged 21 years and above, with at least one diabetes-related consultation visit at a NHG primary care clinic in 2006 and 2007 were included. Enrollees and non-enrollees were propensity-score matched. Hospitalization risk, and total healthcare cost incurred in 2007, 2008 and 2009 were compared between groups. A difference-in-difference strategy and generalized estimating equation approach were used. We adjusted for baseline differences in socio-demographics, cardiovascular risk factors, diabetes-related complications, blood sugar control, and insulin use. **RESULTS:** There were 10,559 enrollees and 22,089 non-enrollees. Before matching, enrollees were younger; a larger share had hypertension, at least one diabetes-related complication, poor blood sugar control and used insulin. Relative to non-enrollees, the unadjusted hospitalization rates and health care cost of enrollees were significantly lower in the post-policy years. After adjusting for baseline differences between propensity-score matched sample of 8881 enrollees and 8881 unique non-enrollees, hospitalization risk for enrollees was significantly lower in 2007 (OR: 0.76; 95% CI: 0.65-0.88) and 2008 (OR: 0.79; 95% CI: 0.68-0.92). The difference, however, was not statistically significant in 2009 (OR: 0.91; 95% CI: 0.79-1.05). While total health care cost was 13-14% lower for enrollees in 2007 and 2008, it was 3% (95% CI: -8%-16%) higher in 2009. **CONCLUSIONS:** By lowering out-of-pocket spending on T2DM outpatient treatment, the policy reduced hospitalization risk and total healthcare cost in the short-term but effects were not sustained.

## PDB85

## EFFECTIVENESS OF COMMUNITY-HOSPITAL-INTEGRATED DIABETES MANAGEMENT SYSTEM IN SHANGHAI MINHANG DISTRICT

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**OBJECTIVES:** The objective was to measure the effectiveness of the information system based community-hospital-integrated diabetes management system in Shanghai Minhang district, as well as to analyze the factors influencing the effectiveness of the system. **METHODS:** The study was based on the information system from the community-hospital-integrated diabetes management program established in Shanghai Minhang district since 2007. The effectiveness of community-hospital-integrated diabetes management system was examined. Logistic regression model was employed to analyze the influencing factors. **RESULTS:** There were 43,709 diabetes patients managed during the study period from October 2008 to September 2009, including Type1 diabetes (T1DM), Type2 diabetes (T2DM), impaired glucose tolerance (IGT), and impaired fasting glucose (IFG) patients. Among the patients who had at least two follow-up visits during the study period, 2.95% IGT patients and 2.34% of IFG patients turned into diagnosed diabetes status. Within one-year diabetes management, the percentage of patients with ideal blood sugar rose from 20.59% to 28.10% according to fasting plasma glucose (FPG) test results. The percentage of patients who monitored blood sugar regularly rose from 77.90% to 83.27%. The percentage of patients who did not exercise reduced from

46.24% to 45.31%. The percentage of patients who monitored diet completely according to doctor's suggestion rose from 80.83% to 82.31%. Regression analysis showed that over 50 years old, taking heavy exercises, attending group follow-ups and door-to-door follow-ups (compared to outpatient follow-up visit) were the factors with positive impact on maintaining ideal blood sugar level. Over 7-year disease duration, overweight, and obesity had negative impact on blood sugar maintaining. **CONCLUSIONS:** The conversion rates from IGT and IFG to diabetes were both relatively low under the community-hospital-integrated diabetes management system in Shanghai Minhang district. The performances in blood sugar control and self-management have been improved during one-year study period. Effectiveness of group follow-up and door-to-door follow-up are superior to that of out-patient follow-up visit.

## PDB86

## EVALUATION OF PHARMACISTS TIME AND THERAPY MANAGEMENT FOR PATIENTS WITH TYPE 2 DIABETES SERVED BY A RURAL FREE CLINIC

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**OBJECTIVES:** Quantify the amount of time spent, number and type of interventions, and clinical and economic impact of medication therapy management (MTM) by pharmacists for patients with diabetes mellitus (DM) in a free clinic serving a rural uninsured population. **METHODS:** Data from 95 patients continuously enrolled in a newly established pharmacist service were analyzed. Patients were  $\geq 18$  years of age, qualified for free care based on income and lack of insurance, and had a diagnosis of DM. Under a collaborative agreement, pharmacists provided MTM for clinic patients. The amount of time pharmacists spent with patients was tracked through MTM CPT codes. Number and types of interventions were captured by drug class. Clinical impact was measured by changes from baseline hemoglobin A1c (HbA1c) levels, blood pressure, and lipid levels. Economic impact was calculated using published cost estimates for patients achieving a  $\geq 1\%$  decrease in HbA1c levels. **RESULTS:** Coding information was captured for 481 patient encounters. Most visits (80.5%) were 30-45 minutes, and included education, counseling, and medication changes. There were 1,159 interventions documented, with 77.6% of interventions changing current medications. Increasing a dose was the most common modification (50.4%), followed by adding an additional medication (28.4%). Insulin was the class most often adjusted or initiated (50% adjustments, 50% new starts), followed by antihypertensive agents (19.1% adjustments, 12.8% new starts). Compared to baseline, 35.7% of patients achieved HbA1c goal of  $\leq 7\%$  (P<0.0001). A significant number of patients also reached SBP goal  $\leq 130$ mmHg (P=0.016), DBP goal  $\leq 80$ mmHg (P=0.007), LDL  $\leq 100$ mg/dL (P<0.001), or triglycerides  $\leq 150$ mg/dL (P=0.0009). Approximately 71% of patients had a  $\geq 1\%$  decrease in HbA1c. Given an expected annual savings of \$1,118/patient, this would equate to a total savings of \$74,906. **CONCLUSIONS:** This study quantified pharmacists time spent on MTM and showed positive clinical and economic outcomes in a rural free clinic.

## PDB87

## REAL-WORLD RETROSPECTIVE ANALYSIS OF DEMOGRAPHIC CHARACTERISTICS AND PREVALENCE OF DIABETES IN SHANGHAI MINHANG DISTRICT

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**OBJECTIVES:** The objective was to examine the demographic characteristics and prevalence of diabetes in Shanghai Minhang district. **METHODS:** The study was based on the information system from the community-hospital-integrated diabetes management program established since 2007. The program screened for diabetes in 12 community health centers, built up an information system of Electronic Health Record (EHR), and conducted various forms of follow-up visits and disease management with different time spans according to patients' diabetes situation. **RESULTS:** There were 43,709 diabetes patients managed during the study period from October 2008 to September 2009. Type1 diabetes (T1DM), Type2 diabetes (T2DM), impaired glucose tolerance (IGT), and impaired fasting glucose (IFG) patients accounted for 0.97%, 92.11%, 5.08%, and 1.83%, respectively. The average diabetes duration was  $7.27 \pm 6.06$  years and the mean age was  $64.98 \pm 11.14$  years old. Among the patients, 5.76% had at least one complication and 0.86% had more than one complication. The most common complication was diabetic vasculopathy, accounting for 45.15% of the patients with complications. Diabetic retinopathy, diabetic nephropathy, diabetic neuropathy, and diabetic dermadrome occupied 34.70%, 15.46%, 13.39%, and 9.82% of the patients with complications, respectively. Based on the last follow-up visit during the study period, the average fasting plasma glucose (FPG) was  $7.05 \pm 1.91$ mmol/L and the average postprandial plasma glucose (PPG) was  $8.64 \pm 3.29$ mmol/L. The percentage of the patients whose blood sugar level was considered to be ideal, fair, and poor was 36.12%, 32.53% and 31.34% respectively. As with HbA1C level, the number was 67.27%, 20.08% and 12.65%. **CONCLUSIONS:** The diabetes patients managed are mainly T2DM with long disease durations and the elderly. The complication prevalence was relatively low, suggesting that there were deficiencies in the complications screening and information recording in the program. The program provided an effective and efficient way to better understand real-world management of diabetes.

## PDB88

## IMPACT OF TELEPHONE AND MAIL INTERVENTION ON DIABETES APPOINTMENT ADHERENCE RATES AND CLINICAL OUTCOMES

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**OBJECTIVES:** Research has shown that a direct suggestion for a patient to schedule an appointment encourages patients to attend their appointments more regularly, which has a direct correlation with improved outcomes. The study's objectives were to determine the relationship between telephone/mail intervention and clinical pharmacist appointment adherence rates; and whether patients who saw a clinical pharmacist  $\geq 3$  more times had significantly different HbA1c levels compared to those who did not see a clinical pharmacist. **METHODS:** This was a retrospective review of a central Texas community health center outpatient electronic medical record from 9/1/2009-1/13/2012. Included patients were adult (18-80 years) type 2 diabetes mellitus patients with HbA1c  $> 9$ . Patients with working telephone numbers were contacted. Those who could not be reached via telephone (e.g., no working number or no answer) or who did not schedule an appointment after the telephone intervention were contacted by mail. Contact method type (telephone, mail, telephone and mail), number of clinical pharmacist visits, HbA1c levels (6 months prior and one year post initial appointment) and demographics were collected. Appointment adherence was calculated as kept visits/total number of patients in each contact method. **RESULTS:** Patients (N=132) were 53.3 $\pm$ 12.4 years, 52.3% female, and 72.7% Hispanic. Patients' appointment adherence rates (raw numbers;rate) for telephone (52/67;77.6%) were higher than mail (14/43;32.6%) and telephone and mail (4/22;18.2%) contact methods. Although not significant ( $p=0.1067$ ), the change in HbA1c from baseline to follow-up (third HbA1c) decreased more with patients (N=40) who visited the pharmacist  $\geq 3$  times (-2.4 $\pm$ 2.2) compared to patients (N=24) who did not visit their pharmacists (-1.5 $\pm$ 2.3). **CONCLUSIONS:** Healthcare practitioners should consider calling or mailing type 2 diabetes patients with uncontrolled diabetes to increase appointment adherence and help patients get better control of their diabetes. Patients who saw their clinical pharmacists  $\geq 3$  times had a 2.4% drop in HbA1c.

#### PDB89

##### REAL-WORLD MANAGEMENT OF DIABETES IN SHANGHAI MINHANG DISTRICT

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**OBJECTIVES:** The objective was to analyze the disease management of diabetes in Shanghai Minhang district and to provide evidence for improving management practices in the future. **METHODS:** The program screened for diabetes in 12 community health centers with totally 943 thousands population, built up an information system of Electronic Health Record (EHR), and conducted various forms of follow-up visits and disease management with different time spans according to patients' diabetes situation. **RESULTS:** There were 43,709 diabetes patients managed during the study period from October 2008 to September 2009, including Type1 diabetes (T1DM), Type2 diabetes (T2DM), impaired glucose tolerance (IGT), and impaired fasting glucose (IFG) patients. Based on the last follow-up visit during the study period, 82.91% of managed diabetes patients monitored blood sugar regularly, while only 1.50% did not monitor at all. The percentage of patients who monitored diet completely according to doctor's suggestion was 81.37%. 92.91% of type 1 diabetes patients were taking medication and the percentage of patients using insulin was 36.32%. The percentage of type 2 diabetes patients using insulin is only 12.37%. Based on the last follow-up visit during the study period, the average fasting plasma glucose (FPG) was 7.05 $\pm$ 1.91mmol/L and the average postprandial plasma glucose (PPG) was 8.64 $\pm$ 3.29mmol/L. The percentage of the patients whose blood sugar level was considered to be ideal, fair, and poor was 36.12%, 32.53% and 31.34% respectively. As with HbA1C level, the number was 67.27%, 20.08% and 12.65%, although the percentage of HbA1C recorded in the system was relatively low. **CONCLUSIONS:** The management of diabetes in Shanghai Minhang district performed well in terms of blood sugar monitoring and diet monitoring. There was need, however, to improve exercise involvement. The blood sugar control was not ideal from clinical perspective, suggesting needs to improve diabetes management for blood sugar control.

#### PDB90

##### ATTITUDES AND SOCIO-DEMOGRAPHIC FACTORS ASSOCIATED WITH THE ADHERENCE TO DIET AND EXERCISE IN DIABETIC PATIENTS

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**OBJECTIVES:** Diet and exercise are key elements along with pharmacological treatment to attain adequate glycemic control in diabetic persons. The aim of this study is to identify the socio-demographic factors and attitudes associated with the following of diet and exercise plans in the treatment of diabetic patients at the Mexican Institute of Social Security (IMSS). **METHODS:** Data from the institutional health survey, encoprevenimss 2010, was used to test the statistical relationship between socio-demographic variables and adherence to diet and exercise plans in the treatment of diabetic patients aged 20 years and older. Two binary logistic regression models were constructed to identify personal attitudes and socio-demographic variables associated with the decision of the patient whether to follow the recommendations. **RESULTS:** 31% of the patients reported fully adhering to the prescribed diet, 25% adhered partially and 8% did not adhere to it; furthermore 27% of the patients reported fully complying with the exercise recommendations, 16% complied partially and 18% did not comply. At a level of significance of 5%, no statistically significant relationship between following diet and exercise plans and gender was found, with  $p$ -value = 0.072 and 0.424 respectively. In contrast, a statistically significant relationship with age groups was obtained,  $p$ -value = 0.000. The results from the logistic regression models show that the main predictors for whether patients would follow recommendations for diet and exercise were personal attitudes. Lack of interest or motivation regarding the importance of these

recommendations increases the probability of poor adherence. With improved education, the probability of greater adherence to these recommendations increases, while patients who work are less likely to exercise or follow the diet plan. **CONCLUSIONS:** Health programs and activities aiming to motivate patients to follow diet and exercise plans should be designed with special emphasis on diabetic patients who work.

#### PDB91

##### SYSTEMATIC REVIEW OF DIABETES DISEASE MANAGEMENT INTERVENTIONS

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**OBJECTIVES:** To improve the health outcomes and reduce costs of employees with diabetes, many employers are initiating diabetes disease management interventions. Given the variety of programs and lack of definitive guidelines reported in the literature, identifying the most appropriate strategy can be challenging. To contribute to employers' understanding of diabetes disease management programs and determine which are most likely to be successful, this review sought to assess the interventions reported in the literature. **METHODS:** A systematic review of PubMed, Embase and Cochrane was performed. Publications reporting the outcomes of diabetes disease management interventions were identified. Accepted publications were abstracted into an evidence table and included in the data interpretation. **RESULTS:** In total, 37 publications met the inclusion criteria and were included in the analysis. Nine distinct categories of diabetes management interventions were identified and assessed: 1) counseling by healthcare provider; 2) group treatment management sessions; 3) education/educational materials; 4) telephone/telemedicine support; 5) web-based support; 6) self-management support; 7) pharmacist intervention; 8) physician education/support and 9) provision of medication or testing supplies. **CONCLUSIONS:** All of the diabetes disease management interventions identified by this systematic review were associated with significantly improved health outcomes, suggesting that patients will benefit from any strategy undertaken. Combinations of multiple interventions demonstrated the best clinical outcomes. It was not possible, however, to determine which interventions would be most effective, given a lack of direct comparisons and potential reporting biases.

#### PDB92

##### THE EVOLUTION OF ORAL ANTI-DIABETES MEDICATION USE IN TAIWAN (1999-2009)

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**OBJECTIVES:** The expenditures for oral anti-diabetic medications have grown markedly over the last decade. This study examined the patterns of use and expenditures of individual anti-diabetic drug classes between 1999 and 2009. **METHODS:** We obtained a 0.2% sample of monthly ambulatory claims from Taiwan National Health Insurance. We assessed volume (DDD/patient/quarter) and government reimbursed costs (costs/patient/quarter) for each antidiabetic drug group over 11 years. **RESULTS:** Between 1999 and 2009, the number of diabetic prescription (patient) increased steadily at an average rate of 12.2% per year. Utilization of oral anti-diabetic drugs increased from 246.05 ddd/patient in 1999\_Q1 to 334.28 ddd/patient in 2003\_Q2, then began to decrease; this change was due to a marked reduction of sulfonylureas (from 235.88 ddd/patient [79.16% of total DDDs] in 2003\_Q2 to 140.37 ddd/patient [58.15% of total DDDs] in 2009\_Q4). Use of biguanides was relatively stable over the study period (average rate 61.56 ddd/patient; 23% of the market; 646.53 NT\$/patient). In 2004\_Q2, there was clear shift in use from an older glizalazide (account for 48.40% of sulfonylureas in 2004\_Q2) to a newer agent, glimepiride (24.12%). Rosiglitazone's use (70.37% of thiazolidinediones) dropped rapidly from 2004\_Q2 due to the safety concern of cardiovascular risk. The total costs of anti-diabetic medications increased from NT\$1931.91/patient in 1999\_Q1 to NT\$3446.95/patient in 2004\_Q2, then began to subsequently a downward trend (NT\$2380.50/patient in 2009\_Q4), primarily due to a substantial reduction in thiazolidinediones (1,100.57 NT\$/patient [29.92% of total costs] and 2004\_Q2 to 569.63 NT\$/patient [23.92% of total costs] in 2009\_Q4). **CONCLUSIONS:** Sulfonylureas and biguanides, generally recommended as first-line therapies, dominated the Taiwan market for diabetic management (86%~100% of total DDDs) over the last decade. Uptake of newer, more expensive agents, namely thiazolidinediones and alpha-glucosidase inhibitors, was small. Our results suggest the utilization pattern of oral anti-diabetic medications in Taiwan is overall consistent with clinical guidelines.

#### PDB93

##### IMPACTS OF DRUG REIMBURSEMENT RATE REDUCTIONS ON USE OF ORAL ANTI-DIABETIC MEDICATIONS IN TAIWAN: AN INTERRUPTED TIME SERIES STUDY

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**OBJECTIVES:** Rapid growth of pharmaceutical costs is a major health care issue in all countries. Taiwan has implemented several drug reimbursement rate reductions since April 2000. This research focuses on changes in use of oral antidiabetic medications following the November 2006 price regulation. **METHODS:** We obtained a 0.2% sample of monthly ambulatory claims from Taiwan National Health Insurance for January 2006 through August 2007. We examined 179 products in seven ATC categories of oral antidiabetics reimbursed, classified as either affected